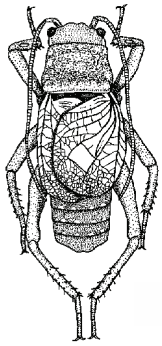

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NEW SPECIES OF BRISTRLETAILS OF THE GENUS *CORYPHOPHTHALMUS* VERHOEFF, 1910 (ARCHAEOGNATHA: MACHILIDAE) FROM NORTH AND SOUTH OSSETIA

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Summary. A new bristletail species, *Coryphophthalmus morulus* Kaplin, **sp. n.** and *C. tskhinvalicus* Kaplin, **sp. n.** are described from North and South Ossetia (Caucasus Major), respectively. Both new species with 2 + 2 eversible vesicles on abdominal coxites II–IV belongs to the subgenus *Coryphophthalmus* s. str. *C. morulus* **sp. n.** differs from other species of this subgenus by the body size, color of the compound eyes, structure of maxillary palps and urocoxite IX. Clypeus, maxillary palps and labial palps of males *C. tskhinvalicus* **sp. n.**, as well as *C. kislovodski* (Kaplin, 2010) and *C. lermontovi* (Kaplin, 2015) without numerous long thin setae, but found in males of other species of this subgenus. New species clearly differs from *C. kislovodski* and *C. lermontovi* by the color of the compound eyes and paired ocelli, structure of compound eyes, urosternites, urocoxites IX, ovipositor and male genitalia.

Key words: bristletails, Machilidae, *Coryphophthalmus*, taxonomy, new species, Caucasus.

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Резюме. Из Северной и Южной Осетии (Большой Кавказ) описаны новые виды щетинохвосток: *Coryphophthalmus morulus* Kaplin, **sp. n.** и *C. tskhinvalicus* Kaplin **sp. n.** Оба новых вида с 2 + 2 выпячивающимися мешочками на II–IV брюшных кокситах относятся к подроду *Coryphophthalmus* s. str. *C. morulus* **sp. n.** отличается от других видов этого подрода размерами тела, цветом сложных глаз, строением нижнечелюстных щупиков и кокситов IX сегмента брюшка. Наличник, нижнечелюстные и нижнегубные щупики *C. tskhinvalicus* **sp. n.**, а также *C. kislovodski* (Kaplin, 2010) и *C. lermontovi* (Kaplin, 2015), без многочисленных длинных тонких щетинок, имеющихся у самцов других видов подрода. Новый вид хорошо отличается от *C. kislovodski* and *C. lermontovi* цветом сложных глаз и парных глазков, строением сложных глаз, стернитов брюшка, кокситов IX сегмента брюшка, яйцеклада и половых органов самца.

INTRODUCTION

The southern European genus *Coryphophthalmus* Verhoeff, 1910 includes two subgenera: *Coryphophthalmus* s. str. (27 species) and *Verhoeffius* Kaplin, 2019 (5 species) with 2 + 2 exsertile vesicles on urocoxites II–IV or II–V, respectively (Kaplin, 2019a, 2019b). Among them, 21 species of the subgenus *Coryphophthalmus* s. str. and one species of the subgenus *Verhoeffius* are described from the Caucasus Major. It is obvious that the Caucasus Major is the center for biodiversity and formation of the subgenus *Coryphophthalmus* s. str.

MATERIALS AND METHODS

Examination of the bristletails collected by the authors into 75% ethanol. Holotypes and two specimen of paratrypes were dissected and mounted on glass microscope slides in the Berlese fluid. Figures were made using microscope and drawing tool. Holotypes and paratypes of the new species are deposited in the collection of the All-Russian Institute of Plant Protection (VIZR), St. Petersburg-Pushkin.

DESCRIPTIONS OF NEW TAXA

Order Archaeognatha

Family Machilidae Grassi, 1888

Subfamily Machilinae Kaplin, 1985

Genus *Coryphophthalmus* Verhoeff, 1910

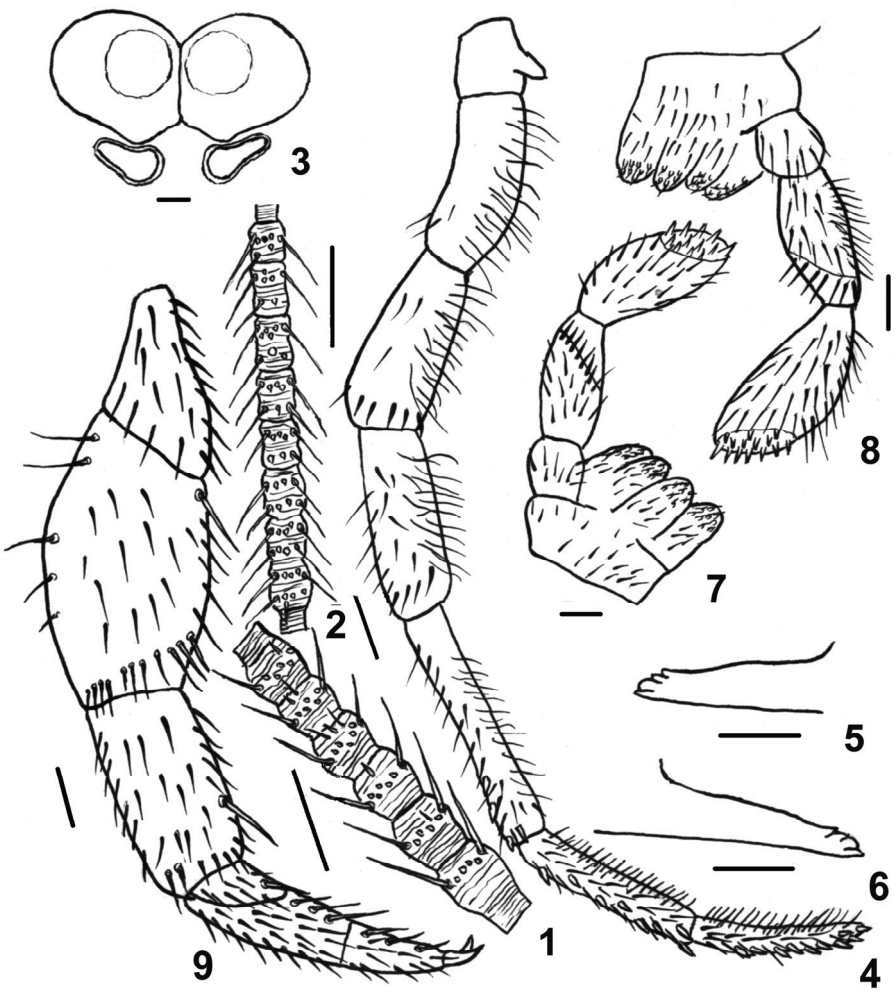
Type species: *Coryphophthalmus banaticus* Verhoeff, 1910.

***Coryphophthalmus morulus* Kaplin, sp. n.**

http://zoobank.org/NomenclaturalActs/D4EB0EE3-D286-4093-A61A-B7CF0D8AD322

Figs 1–17

MATERIAL. Holotype – ♂, **Russia**: North Ossetia-Alania, environs of Koban, 42°55'10"N, 44°29'41"E, 1300 m, 03.V 2019, leg. V. Kaplin, L. Kiseleva, O. Kozhevnikova (VIZR) (in slides). Paratypes – 7 ♂, 8 ♀, same locality, data and leg., as for holotype (VIZR) (1 ♂ and 1 ♀ in slides; 6 ♂, 7 ♀ in 75% ethanol).



Figs 1–9. *Coryphophthalmus morulus* Kaplin, sp. n., holotype ♂ (2–4, 6, 8, 9), paratype ♀ (1, 5, 7): 1, 2 – distal chain of flagellum; 3 – compound eyes and paired ocelli; 4 – maxillary palpus; 5, 6 – apex of mandible; 7, 8 – labial palpus and labium (part); 9 – fore leg (part). Scale bars = 0.1 mm.

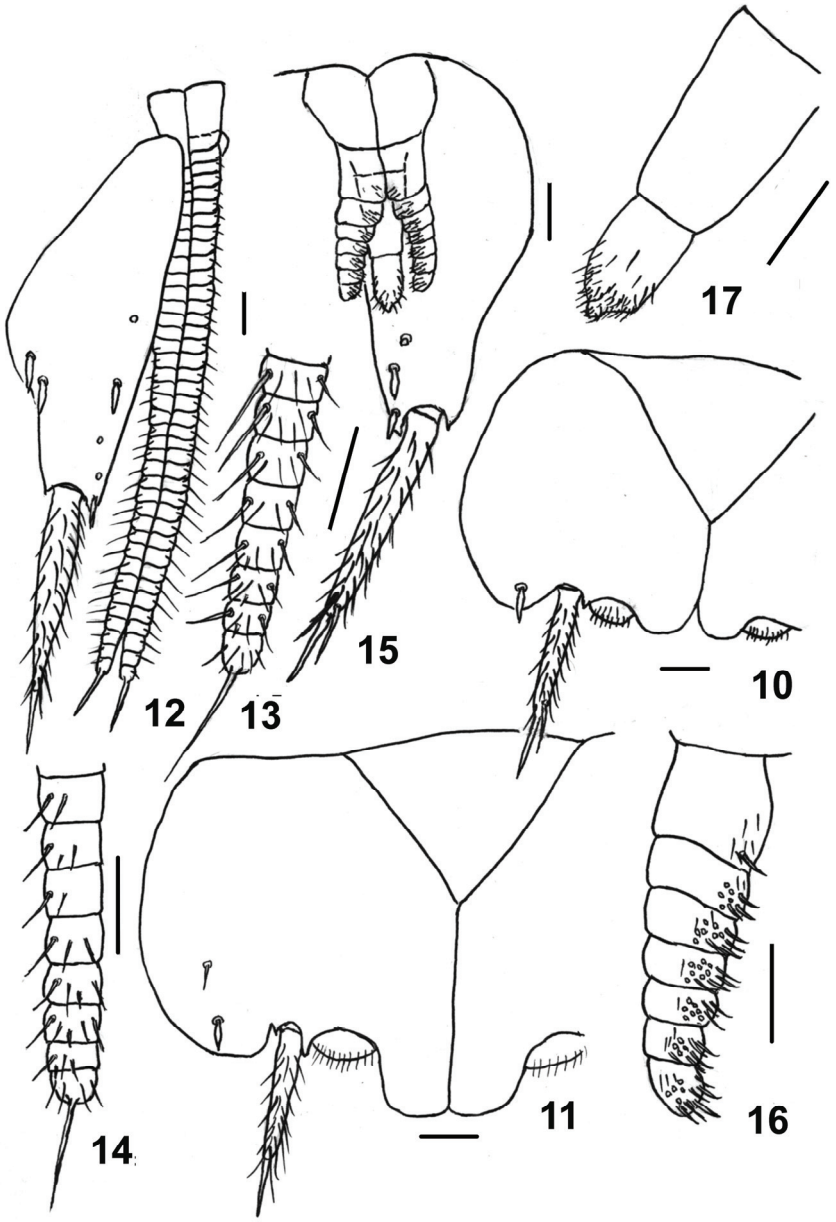
DESCRIPTION. Body length: male 6.1–6.5 mm, female 6.4–6.8 mm. Body width: male and female 1.5–1.7 mm. General body color whitish or light yellowish, with hypodermal pigment. Antennal base, occiput, frons, clypeus, maxillae, mandibles, labrum, labium, hypopharynx, coxae of all legs, thoracic and abdominal tergites and sternites with purple-brown hypodermal pigment of weak or medium intensity. The head is most pigmented. Color of scales blackish-brown on the upper surface and brown on the lower surface of the body. They are darker in males than females. The scales form a longitudinal striped pattern on the upper part of the male body. Antennae of male and female shorter than body. Distal chains of flagellum divided into 6–10 articles in male and into five or six articles in female (Figs 1, 2). Clypeus and labrum of male with long thin bristles. Cercus approximately 0.38–0.40 (male) or 0.35 (female) body length, including about 16 articles. Apex of cercus with one lateral spike. Articles of cerci, except for apical three, with 2 or 3 colorless supporting macrochaetae on inner side. About 15–18 basal articles of caudal filament also with supporting macrochaetae on lateral sides.

Compound eyes bicolor light brown with a large light green spot in the back part of the eye near the eyes contact line (in alcohol). Ratio of diameters of green spot and eye about 0.55–0.60. Ratio of length to width of compound eye about 1.0 in both sexes; ratio of length of contact line to length of eye 0.48–0.50 (male) or 0.45–0.47 (female). Paired ocelli submedian, pear shape, dark brown with narrow white border, 1.5–1.6 times as wide as long in both sexes. Distance between inner margins of ocelli 0.20–0.22 and between their outer margins 0.60–0.65 total width of compound eye in both sexes (Fig. 3).

Apical article of maxillary palp 1.06–1.08 (male) or 0.72–0.73 (female) times as long as preceding one. Dorsal surface of 7th, 6th and 5th articles of maxillary palp with 9 or 10, 7 or 8 and 4 (male) or 7 or 8, 9 and 3 (female) hyaline spines, respectively. Ventral surface of 2–5th articles of male maxillary palp with relatively numerous and long thin setae (Fig. 4). Apical article of labial palp triangularly oval, 2.2 or 2,3 (male) or 2.3 or 2.4 (female) times as long as wide (Figs 7, 8). Mandibles with four (female) distal teeth in both sexes (Figs 5, 6).

Fore and middle femur and tibia of male and female widened (Fig. 9). Fore femur of male without sensory field. Ratios of length to width of femur, tibia and tarsus as shown in Table 1. Ratio of length of 3rd tarsomere of tarsus to total length of tarsus 0.34 or 0.35 (male), 0.39 or 0.40 (female). Legs of male without long, thin bristles. Ventral surface of femora, tibiae and tarsi without spine-like chaetae in both sexes. Middle and hind legs with coxal styli. Length of styli 0.50–0.53 mm in both sexes. Ratio of length of styli to width of middle and hind coxae about 1.6 or 1.7 in female, 1.4 or 1.5 in male.

In both sexes, abdominal segments I and V–VII with 1 + 1 eversible vesicles, but abdominal segments II–IV with 2 + 2 eversible vesicles (Figs. 12, 13). In male, posterior angle of urosternites II, III–VI, VII and VIII approximately 80°, 66–68°, 71° and 90°; but in female, posterior angle of urosternites II, III–IV and V–VII about 81°, 75° and 68–74°. Ratios of lengths of stylus (without apical spine) and coxite on segments II–IX as shown in Table 2.



Figs 10–17. *Coryphophthalmus morulus* Kaplin, sp. n., holotype ♂ (10, 15–17), paratype ♀ (11, 12–14): 10 – urosternite and urocoxites (part) V; 11 – urosternite and urocoxites (part) VII; 12 – urocoxite IX, with anterior gonapophyses; 13 – distal part of anterior gonapophyse; 14 – distal part of posterior gonapophyse; 15 – urocoxite IX, with penis and parameres; 16 – paramere; 17 – penis. Scale bars = 0.1 mm.

Table 1. Ratios of length to width of main leg segments of *Coryphophthalmus morulus* sp. n.

Segments	Sex, pair of legs					
	Male			Female		
	fore	middle	hind	fore	middle	hind
Tarsus	4.08–4.17	3.74–3.82	5.00–5.33	4.53–4.84	3.75–4.00	4.75–5.17
Tibia	1.76–1.82	1.79–1.90	2.62–2.72	1.55–1.58	1.45–1.51	2.06–2.22
Femur	1.76–1.78	1.76–1.82	1.93–1.94	1.60–1.69	1.78–1.80	1.69–1.81

Shape of urosternite V in male as shown in Fig. 10. Inner posterior lobes of coxites VII of female protruding (Fig. 11); ratio of length to total width of these lobes about 0.37. Thoracic tergites, abdominal tergites I–IV, urosternites, abdominal coxites I–V without macrochaetae; in both sexes, abdominal tergite V with 1 + 1 macrochaetae, but abdominal tergite VI–X with 2 + 2 macrochaetae. Distribution of sublateral macrochaetae on abdominal coxites VII–IX as shown in Table 3. Abdominal coxites IX with 3 + 3 inner (male) or 2 + 2 outer and 5 + 4 inner (female) sublateral macrochaetae, respectively (Figs 12, 15).

Table 2. Ratios of lengths of some abdominal structures in *Coryphophthalmus morulus* sp. n.

Abdominal segments	Urosternite / coxite		Stylus (not including apical spines) / coxite		Apical spine / stylus	
	male	female	male	female	male	female
II	0.72	0.70	0.56	0.55	0.43	0.42
III	0.71	0.71	0.54	0.54	0.42	0.42
IV–V	0.72	0.66–0.67	0.50–0.51	0.48–0.49	0.44–0.45	0.45–0.46
VI	0.64	0.67	0.50	0.48	0.44	0.46
VII	0.60	0.59	0.51	0.50	0.46	0.45
VIII	0.39	–	0.60	0.68	0.40	0.40
IX	–	–	0.59	0.54	0.37	0.32

Ovipositor slender, elongate (1.1– 1.3 mm), not reaching apex of styli IX by about 0.1–0.7 length of latter (Fig. 12). Anterior and posterior gonapophyses with approximately 38 or 39 articles. Two basal articles of anterior gonapophyses and about 24 basal articles of posterior gonapophyses glabrous. Apical spines of gonapophyses as long as 3.5–3.8 apical articles combined. Distal articles of anterior and posterior gonapophyses with four or five and with three or four setae, respectively (not counting sensory setae and apical spines) (Figs 13, 14).

Male genitalia with one pair of parameres on abdominal segment IX. Parameres with 1 + 6 articles (Fig. 16), slightly not reaching apex of penis. Penis and parameres significantly not attaining level of apex of coxites IX, ratio distance between apexes

of penis and of coxites IX to width of apical article of penis 3.3–3.7 (Fig. 15). Ratio lengths of basal and apical articles of penis 1.6–1.7 (Figs 16, 17).

ETYMOLOGY. The new species is named after the predominant color of the body scales.

HABITATS. All specimens of *Coryphophthalmus morulus* sp. n. were collected in subalpine plant belt of the Caucasus (cereals, grasses, sparse woody-shrub vegetation (*Salix, Rosa, Prunus*), under stones, 1300 m above sea level.

Table 3. Distribution of sublateral macrochaetae on abdominal tergites and coxites of *Coryphophthalmus morulus* sp. n.

Abdominal segments	**Tergite**		**Coxite**	
	male	female	male	female
I–IV	0	0	0	0
V	1 + 1	1 + 1	0	0
VI	2 + 2	2 + 2	0–1 + 0–1	0–1 + 0–1
VII	2 + 2	2 + 2	2 + 2	1 + 1
VIII	2 + 2	2 + 2	2 + 2	1 + 1
IX	2 + 2	2 + 2	0/3 + 3/0	2/4 + 5/2
X	2 + 2	2 + 2	–	–

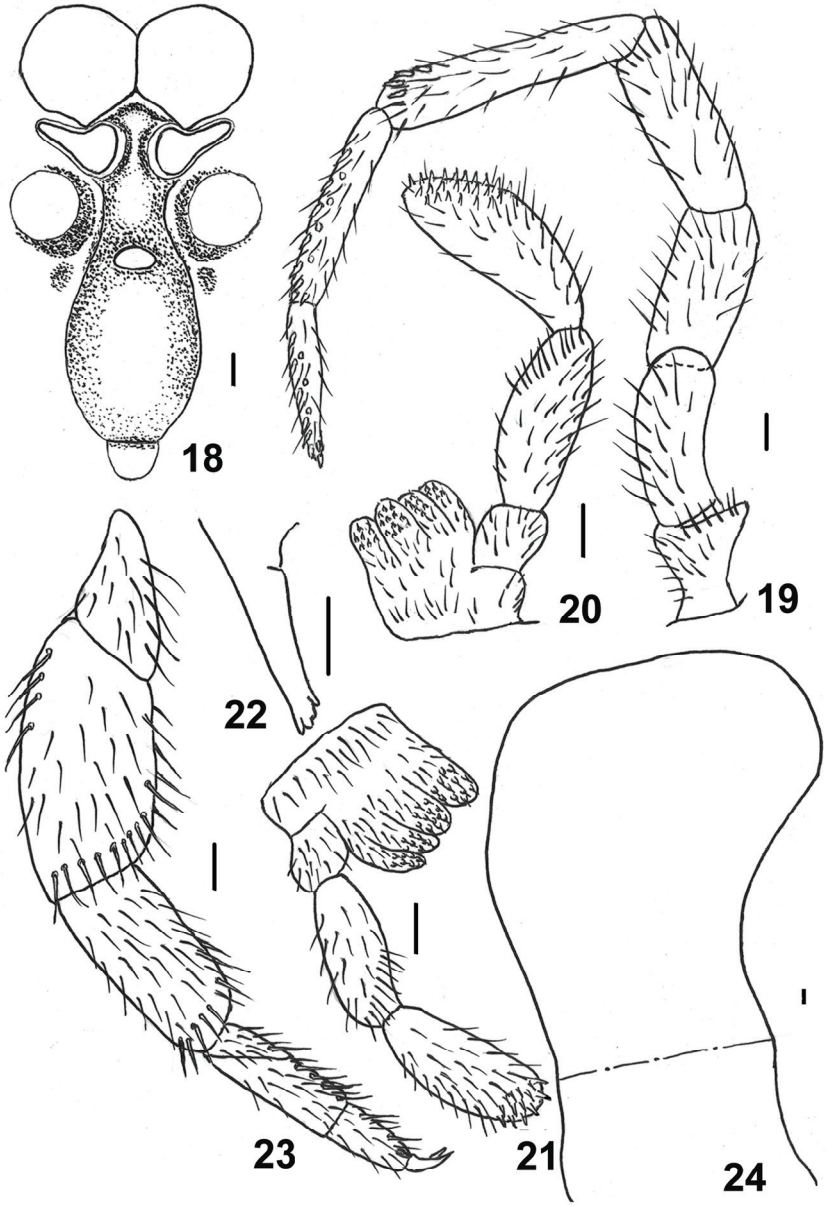
DIFFERENTIAL DIAGNOSIS. *Coryphophthalmus morulus* sp. n. with 2 + 2 eversible vesicles on abdominal coxites II–IV belongs to the subgenus *Coryphophthalmus* s. str. The new species differs from other species of this subgenus by the body size, color of the compound eyes, maxillary palps, urocoxite IX. Body length of *C. morulus* sp. n. 6.1–6.5 mm, other species of this subgenus 7–11.5 mm. The color of the compound eyes of *C. morulus* sp. n. light brown with a large light green spot. The color of the compound eyes of other species of the subgenus *Coryphophthalmus* s. str. dark with a bluish tint, dark, black, more rarely brown with redish tint, blackish brown, brown, brownish-gray, bluish-brown with mottled pattern, blackish-dark brown with green sport, dark green. Apical article of male maxillary palp of new species longer, in other species shorter than preceding one. Styli (not including of apical spines) relatively short. Ratio of length of stylus to urocoxite IX 0.59 (male) or 0.55 (female).

Coryphophthalmus tskhinvalicus **Kaplin, sp. n.**

http://zoobank.org/NomenclaturalActs/09E4D918-6C5A-4371-876C-DBF788AA9A37

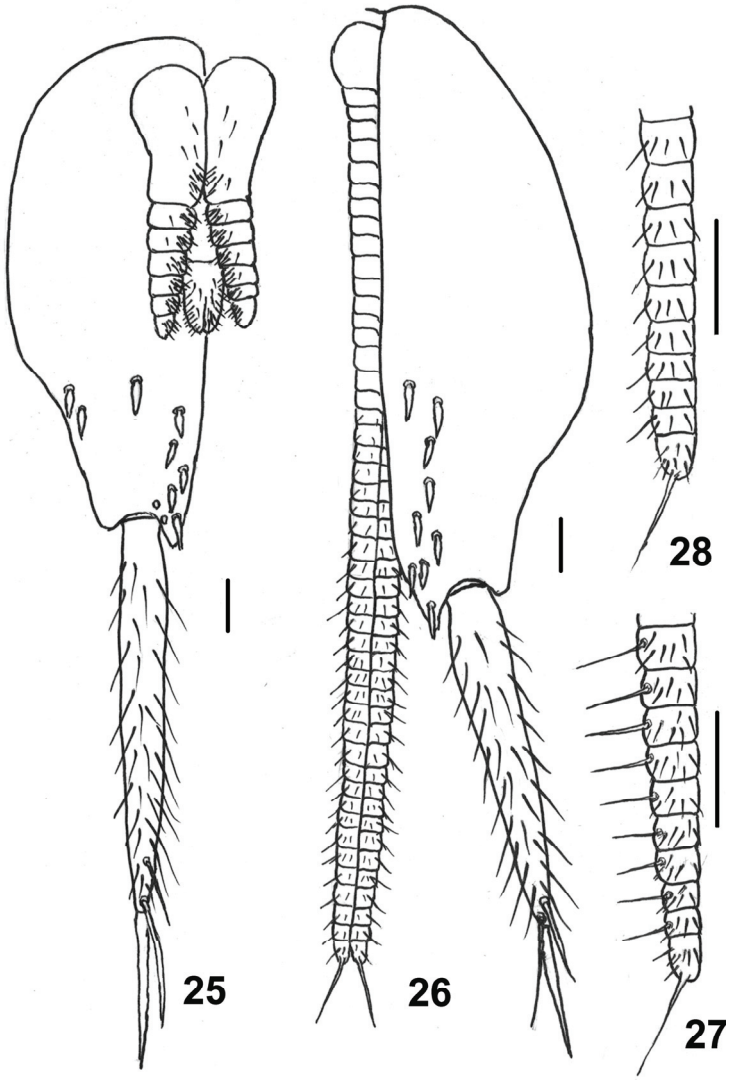
Figs 18–28

MATERIAL. Holotype – ♂, **South Ossetia**: environs of Tskhinval, 42°13'32"N, 43°58'12"E, 880 m, 30.IV 2019, leg. V. Kaplin (VIZR) (in slides). Paratypes – 8 ♂, 5 ♀, same locality, data and leg., as for holotype (VIZR) (1 ♀ in slides; 8 ♂, 4 ♀ in 75% ethanol).



Figs 18–24. *Coryphophthalmus tskhinvalicus* Kaplin, sp. n., holotype (18–20, 23, 24) ♂, paratype ♀ (21): 18 – front of the head (vertex, compound eyes, paired ocelli, frons, antennae bases, median ocellus, clypeus, labrum); 19 – maxillary palpus; 20, 21 – labial palpus and labium (part); 22 – apex of mandible; 23 – part of fore leg (tarsus, tibia, femur and trochanter), 24 – pronotum. Scale bars = 0.1 mm.

DESCRIPTION. Body length: male 6.8–8.0 mm, female 7.1–8.5 mm. Body width: male and female 1.8–2.2 mm. General body color whitish, almost without hypodermal pigment. Antennal base, frons, lateral parts of clypeus, maxillae, mandibles, coxae of all legs, the base of cerci, caudal filament with purple-brown hypodermal pigment of weak or medium intensity (Fig. 18). Color of scales brown.



Figs 25–28. *Coryphophthalmus tskhinvalicus* Kaplin, sp. n., holotype (25) ♂, paratype ♀ (26–28): 25 – urocoxite IX, with penis and parameres; 26 – urocoxite IX, with posterior gonapophyses; 27 – distal part of anterior gonapophyse; 28 – distal part of posterior gonapophyse. Scale bars = 0.1 mm.

Antennae of male and female shorter than body. Distal chains of flagellum divided into 10–12 articles in male and into 7–11 articles in female. Clypeus of male without long thin bristles. Cercus approximately 0.36–0.38 body length in male and female, including about 18 articles. Apex of cercus with one lateral spike. Articles of cerci, except for apical one, with 1–3 colorless supporting macrochaetae on inner side. Caudal filament also with supporting macrochaetae.

Compound eyes black (in alcohol). Ratio of length to width of compound eye 1.06–1.08; ratio of length of contact line to length of eye about 0.48 in both sexes. Paired ocelli submedian, pear shape, reddish-brown with narrow white border, 1.4–1.6 times as wide as long in both sexes. Distance between inner margins of ocelli 0.16 or 0.17 and between their outer margins 0.66 or 0.67 total width of compound eye in both sexes (Fig. 18).

Apical article of maxillary palp 0.81–0.83 (male) or about 0.90 (female) times as long as preceding one. Dorsal surface of 7th, 6th and 5th articles of maxillary palp with 11, 11 or 12 and 3 or 4 hyaline spines in both sexes, respectively (Fig. 19). Apical article of labial palp triangularly oval, about 2.6 times as long as wide in both sexes (Figs 20, 21). Ventral surface of articles of maxillary palp and dorsal surface of articles of labial palp of male without relatively numerous and long thin setae. Mandibles with three distal teeth in both sexes (Fig. 22).

Fore femur of male and female widened (Fig. 23). Fore femur of male without sensory field. Ratios of length to width of femur, tibia and tarsus as shown in Table 4. Ratio of length of 3rd tarsomere of tarsus to total length of tarsus 0.36–0.38 in both sexes. Legs of male without long, thin bristles. Ventral surface of femora, tibiae and tarsi without relatively short, pigmented supporting spine-like chaetae in both sexes. Middle and hind legs with coxal styli. Length of styli 0.55–0.60 mm in both sexes. Ratio of length of styli to width of middle and hind coxae about 1.4 in female, 1.5 or 1.6 in male. Pronotum with a deep notch without macrochaetae (Fig. 24).

Table 4. Ratios of length to width of main leg segments of *Coryphophthalmus tskhinvalicus* sp. n.

Segments	**Sex, pair of legs**					
	Male			**Female**		
	fore	middle	hind	fore	middle	hind
Tarsus	5.22–5.28	5.20–5.23	6.00–6.11	4.46	4.43–4.46	5.83–5.85
Tibia	2.34–2.39	2.35–2.46	3.63–3.65	1.92–1.94	1.90–1.92	2.84–2.87
Femur	1.95–2.00	2.33–2.40	2.69–2.73	1.67–1.70	1.92–1.96	2.10–2.13

In both sexes, abdominal segments I and V–VII with 1 + 1 eversible vesicles, but abdominal segments II–IV with 2 + 2 eversible vesicles. Ratios of lengths of stylus (without apical spine) and coxite on segments II–IX as shown in Table 5. Posterior angle of urosternites I–VIII in male and I–VII in female as shown in Table 6.

Table 5. Ratios of lengths of some abdominal structures in *Coryphophthalmus morulus* sp. n.

Abdominal segments	Urosternite / coxite		Stylus (not including apical spines) / coxite		Apical spine / stylus	
	male	female	male	female	male	female
I	0.24	0.24	–	–	–	–
II	0.61	0.57	0.53	0.44	0.52	0.49
III	0.64	0.63	0.49	0.45	0.54	0.54
IV	0.63	0.68	0.48	0.47	0.58	0.55
V	0.62	0.67	0.48	0.47	0.62	0.58
VI	0.62	0.65	0.46	0.46	0.63	0.57
VII	0.55	0.52	0.48	0.45	0.67	0.59
VIII	0.41	–	0.65	0.64	0.50	0.50
IX	–	–	0.77	0.57	0.36	0.37

Table 6. Distribution of sublateral macrochaetae on abdominal tergites and coxites and posrerior angle urosternites of *Coryphophthalmus tskhinvalicus* sp. n.

Abdominal segments	Sublateral macrochaetae				Posterior angle of urosternite (°)	
	Tergite		Coxite			
	male	female	male	female	male	female
I	0	0	0	0	151	161
II	0	0	0	0	75	81
III	0	0	0	0	76	83
IV	0–1 + 0–1	0	0	0	74	78
V	1 + 1	1 + 1	0	0	71	73
VI	1 + 1	2 + 2	0	0	63	71
VII	2 + 2	2 + 2	2 + 2	1 + 1	65	79
VIII	2 + 2	2 + 2	2–3 + 2–3	2 + 2	83	–
IX	2 + 2	2 + 2	2/6 + 8/2	0/9 + 9/0	–	–
X	3 + 3	2 + 2	–	–	–	–

Inner posterior lobes of coxites VII of female protruding; ratio of length to total width of these lobes about 0.50. Thoracic tergites, abdominal tergites I–III, urosternites, abdominal coxites I–VI without macrochaetae in both sexes. Distribution of sublateral macrochaetae on abdominal tergites and coxites as shown in Table 6. Abdominal coxites IX with 2 + 2 outer spines (male) and 6 + 8 (male) or 9 + 9 (female) inner spines (Figs 25, 26).

Ovipositor slender, elongate (1.6– 2.2 mm), reaching apex of styli IX (Fig. 25). Anterior and posterior gonapophyses with approximately 48 articles. Two basal articles of anterior gonapophyses and about 17 or 18 basal articles of posterior gonapophyses glabrous. Apical spines of gonapophyses as long as 3.6–3.8 apical articles combined. Distal articles of anterior gonapophyses with 5–7, posterior gonapophyses with 4–7 setae (not counting sensory setae and apical spines) (Figs 27, 28).

Male genitalia with one pair of parameres on abdominal segment IX. Parameres with 1 + 6 articles, reaching apex of penis. Penis and parameres significantly not attaining level of apex of coxites IX, ratio distance between apexes of penis and of coxites IX to width of apical article of penis about 5.9 (Fig. 25).

ETYMOLOGY. The new species takes its name from the type locality.

HABITATS. All specimens of *Coryphophthalmus tskhinvalicus* sp. n. were collected collected in a pine (*Pinus* sp.) grove among the stones near the Great Liakhvi River.

DIFFERENTIAL DIAGNOSIS. *Coryphophthalmus tskhinvalicus* sp. n. with 2 + 2 eversible vesicles on abdominal coxites II–IV belongs to the subgenus *Coryphophthalmus* s. str. Among species of this subgenus, clypeus, maxillary palps and labial palps of males *C. tskhinvalicus* sp. n., as well as *C. kislovodski* (Kaplin, 2010) and *C. lermontovi* (Kaplin, 2015) from Stavropol Krai without numerous long thin setae (Kaplin, 2010, 2015). The main morphological differences between them are shown in Table 7.

Table 7. Main morphological differences between *Coryphophthalmus tskhinvalicus* sp. n. and closest congeners

Morphological characters		***C. tskhinvalicus* sp. n.**	***C. kislovodski* (Kaplin, 2010)**	***C. lermontovi* (Kaplin, 2015)**
Color of compound eyes		black	dark	dark with a blue tint
Color of paired ocelli		reddish brown	brown	dark brown
Ratio of length to width of compound eye		1.06–1.08	0.95–1.00	0.97–1.03
Ratio of length of contact line to length of eye		0.48	0.50–0.55	0.50–0.60
Number of distal teeth in mandibles		3	4	4
Posterior angle of urosternite V		71–73°	75–80°	82–90°
Ratios of lengths of stylus (not including apical spines) and urocoxite IX	male	0.77	0.74	0.69
	female	0.57	0.61	0.95
Number of divisions of ovipositor		48	40–42	40–42
Ratio distance between apexes of male genitalia and of coxites IX to width of apical article of penis		5.9	3.3	6.2

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